

**WRITTEN STATEMENT BY  
DR. KATHRYN D. SULLIVAN  
ASSISTANT SECRETARY OF COMMERCE  
FOR ENVIRONMENTAL OBSERVATION AND PREDICTION AND  
DEPUTY ADMINISTRATOR  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
U.S. DEPARTMENT OF COMMERCE  
HEARING TITLED**

**CONTINUING OVERSIGHT OF THE NATION'S WEATHER SATELLITE  
PROGRAMS – AN UPDATE ON JPSS AND GOES-R**

**BEFORE THE  
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT, AND  
SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT  
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY  
U.S. HOUSE OF REPRESENTATIVES**

**June 27, 2012**

Good afternoon Chairman Broun and Chairman Harris, Ranking Member Tonko and Ranking Member Miller, and Members of the Subcommittees. My name is Dr. Kathryn D. Sullivan. I am the Assistant Secretary for Environmental Observation and Prediction for the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA). Thank you for the opportunity to join Mr. David Powner from the Government Accountability Office (GAO), and Mr. Marcus Watkins from the National Aeronautics and Space Administration (NASA) at today's hearing which will focus on GAO's most recent reviews of the Joint Polar Satellite System (JPSS) and the Geostationary Operational Environmental Satellite-R Series (GOES-R).

I have three key messages to convey, which I will expand upon more fully in my testimony and during our discussions today.

First: NOAA's satellite programs are critically important to providing the American people with accurate and reliable weather forecasts up to a week in advance. They also provide the vital "eye in the sky" that is so essential to issuing watches and warnings of severe weather (hurricanes, thunderstorms, tornadoes, and winter storms) that jeopardizes lives and property.

Second: NOAA has stabilized the management structure, staffing, funding, requirements, and oversight of these programs, leading to the completion of key program milestones. This gives us reason to have confidence in our ability to meet the cost, schedule, and performance milestones that lie ahead.

Third: These programs require stable budgets if they are to stay within their cost, schedule, and performance baselines. We must maintain schedule to ensure that each satellite is ready for launch before its predecessor satellite reaches its end of life; otherwise, we will have gaps in coverage that will erode the accuracy and reliability of the forecasts, watches, and warnings that our Nation has come to rely upon.

The GAO has consistently provided impartial assessments and valuable recommendations in support of our efforts, and I and my NOAA colleagues greatly appreciate the work of Mr. Powner and his team. They are a dedicated, competent group of individuals whose efforts have helped us strengthen our satellite programs and deliver these spacecraft to fulfill our mission. As in the past, we will be responsive to the recommendations in their latest reports. We are also thankful to the NASA team for their tremendous support for these and other NOAA satellite acquisition programs.

### **NOAA's Satellite Programs Are Critically Important**

Both polar-orbiting and geostationary systems are vital to the accuracy and reliability of today's weather forecasts, but their roles are not identical. The observational data these systems provide represent the vast majority – more than 90 percent – of the data input to the National Weather Service's (NWS) numerical models for 3-7 day weather forecasts. Of that amount, polar-orbiting satellites, and here I'm including not only NOAA's spacecraft but also NASA's Earth Observing System, and NOAA and European instruments carried on European weather satellites, provide over 80 percent of the observational data for Numerical Weather Prediction models, with the rest of the data used in the models coming from geostationary and in-situ data<sup>1</sup>. The output from these models supports the 3- to 7-day weather forecasts on which American citizens, businesses, and industries have come to depend. Therefore, loss of polar-orbiting data would have the greatest impact on weather outlooks issued for day 3 and beyond.

NOAA's geostationary weather satellites provide the "eye in the sky" that allows weather forecasters to assess current conditions (i.e., 0-3 days) as they evolve and provide the critical watches and warnings of severe weather. With the significant number of extreme and costly weather events affecting the Nation in recent years, the public has come to increasingly rely on NOAA forecasts to support the protection of lives and property. Having an accurate forecasting and warning system in place is essential as businesses and families prepare for extreme weather events affecting lives and property.

### **NOAA Has Stabilized These Satellite Programs and Is Making Real Progress**

The GOES-R Series Program continues to make good progress and remains on schedule and on budget. All five instruments, the spacecraft, ground system, algorithm and data product development, and antennae are under contract, and in April 2012, the selection of the launch service provider was announced. The GOES-R Series Program Office, composed of both NOAA and NASA personnel, is a high-caliber, smoothly functioning team. In May 2012, GOES-R, following a major review, was approved to enter its next phase of development, which includes a formal establishment of the program's schedule and cost projections. The first satellite in the GOES-R Series is making good progress towards its launch date in the first quarter of FY 2016.

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<sup>1</sup> NWS's Global Forecast System model data input for 3-7 day forecasts is approximately:

- Satellite data 94 percent:
  - Polar-orbiting satellite data: 84 percent (includes NOAA POES, NASA EOS, Metop)
  - Geostationary satellite derived winds: 10 percent (includes GOES)
- In-situ data: 6 percent (including all surface observations, all global upper air observations)

The JPSS Program is coming out of a difficult two-year transition from the old tri-agency NOAA-NASA-Air Force NPOESS program to a new NOAA JPSS program with NASA responsible for the acquisition. The transition is now behind us. The JPSS program office is running; the contracts have been transitioned to NASA; and the Suomi NPP satellite has been launched. The JPSS-1 satellite is ramping up since receiving its FY 2012 appropriations and is working towards its launch date in the second quarter of FY 2017. However, we are mindful that there is a long road between now and the launch of the JPSS-1 satellite which will require all the management and engineering skill of the JPSS team to ensure that the acquisition of the program goes well.

### **Satellite Program Budget Stability**

We have worked hard over the past year to stabilize and improve the management of these vital programs and wish to work with you to ensure these satellite programs receive the stable and sufficient budget they need. . We are confident that we now have solid life cycle cost figures and budget profiles for both programs, and we are committed to meeting them.

We are grateful to the Congress and this Committee for your bipartisan recognition of the importance of these programs to the Nation and for the solid support you provided in the final FY 2012 appropriations bill. We hope to build on that foundation with the appropriations committees in the FY 2013 appropriations. Sufficient and stable funding for these programs will allow NOAA to achieve the GOES-R and JPSS launch readiness dates (LRD) on schedule, with their full instrument suite, and within budget.

I would now like to provide separate updates of the GOES-R and JPSS Programs.

### **Progress on the GOES-R Series Program**

The GOES-R Series Program is NOAA's next generation geostationary satellite constellation. Geostationary satellites are our observational sentinels in space, providing constant watch for severe weather such as hurricanes, conditions conducive for tornadoes, flash floods, and wildfires. With two geostationary satellites always in operation (GOES-West and GOES-East), we are able to track severe weather from off the coast of Africa to our shores, across the continental U.S., and out to the waters surrounding Hawaii. This observation also allows us to track hurricane formation in the Atlantic and Pacific. An on-orbit spare satellite assures continuity of the mission. The GOES satellites also provide coverage from lower latitudes of Alaska to higher latitudes of South America. The GOES satellites complement ground-based observational systems such as Doppler Radar to provide NWS forecasters with near real-time data used to support operational weather forecasts.

Mr. Greg Mandt, the GOES-R Series System Program Director (SPD), and his team continue to provide strong management of this program, which remains within budget and on track to meet the first of the GOES-R Series satellite's launch readiness date in the first quarter FY 2016. Significant progress has been made, including:

- Successful completion of the GOES-R Mission Preliminary Design Review, followed by Key Decision Point Approval to proceed towards Mission Critical Design Review;
- Successful completion of the Critical Design Reviews for the GOES-R instruments, spacecraft and core ground segment;
- Increased use of the GOES-R Proving Ground to provide users with exposure to and familiarity with the GOES-R products; and
- Good progress on the construction of the ground antenna and command/data acquisition sites.

The Chairman of the GOES-R Standing Review Board (SRB), which provides non-advocate and objective reviews, recently reported that the GOES-R Program, including the Flight and Ground Projects and the Program Systems Engineering, has come together as a team and is working very well together. Following a detailed technical and programmatic review, the SRB recommended that the GOES-R Series Program proceed to Critical Design Review via a Joint NOAA/NASA Program Management Council (PMC) approval. The PMC, chaired by NOAA Administrator Dr. Jane Lubchenco, formally approved the GOES-R Series Program to proceed toward Critical Design Review which is the point where an assessment is made that the GOES-R Series Program is on track to complete the flight and ground system development and mission operations, meeting mission performance requirements within the identified cost and schedule constraints. This decision also reaffirmed the program's decision to exercise contract options for the GOES-T and -U spacecraft, agreeing that exercising these options represents the least-cost and highest mission assurance approach for maintaining the operational geostationary constellation.

While significant progress has been made, NOAA acknowledges that risks remain to achieving the GOES-R launch readiness in the first quarter of FY 2016. The program continues to be budgeted at a high confidence level, and Independent Cost Estimates conducted in 2007 and 2011 confirmed the overall consistency in the program's Life Cycle Cost projections. However, program budget reserves in FY 2013 are lower than the NASA standard of 20 percent due to delays incurred as a result of a nine month protest of the spacecraft contract combined with budget reductions in previous years. The program is maintaining the recommended level of funded schedule reserves, but parametric (or modeled) schedule estimates suggest a lower than desired schedule confidence (48 percent vs. 70 percent per NASA standards) to achieve its LRD.

The current GOES-R schedule reflects 164 days of schedule reserves. Further, recent history shows that GOES-R has been able to maintain a high-level of schedule stability, with only two changes to the LRD since 2007 which were due to the previously mentioned budget reduction and contract protest. Notwithstanding these challenges, the GOES-R Series Program remains within its Life Cycle Cost. Given the priority placed on minimizing gaps in geostationary coverage, the significant program progress to date, and the affirmative recommendation of the SRB, the NOAA/NASA PMC has affirmed that the greatest potential for maintaining constellation availability is to continue to aggressively manage the GOES-R schedule toward the planned first quarter of FY 2016 LRD.

Continued success of the GOES-R Series Program requires full funding of the President's FY 2013 Budget Request. The low budget reserve posture the program faces in the near years contributes to the need to fund the program at requested levels to minimize program's

vulnerability to disruptions or delays in funding. In doing so, the GOES-R Series Program will receive the programmatic and budget stability it needs to support mission success.

### **GAO Review of the GOES-R Program**

The GAO offers four recommendations for the GOES-R Series Program. These recommendations include improving visibility into the Program's reserve posture throughout the life of the program; continuing to strengthen the program's use of scheduling best practices and its articulation of risks and risk mitigation plans; adding the risk that GOES-S milestones may be affected by GOES-R development to the program's critical risk list; and ensuring that this risk, along with the program-identified risk of funding stability, continue to be monitored and mitigated.

NOAA and the Department understand the recommendations that the GAO has brought forward and fully concur with the recommendations addressing visibility of reserves, scheduling best practices, and adding the risk associated with GOES-S milestones to the Program's critical risk list. Further, we concur with the intent of the recommendation associated with strengthening the program's articulation of risk and risk mitigation plans. The program has actions underway to improve the risk management process in the areas suggested by the GAO.

### **Progress on the JPSS Program**

NOAA's Polar-orbiting Operational Environmental Satellite (POES) series provides surface and atmospheric information ranging over the entire Earth. Placed in the afternoon orbit, NOAA POES and NASA EOS satellites are crucial for NWS's 3-7 day weather forecasts and environmental modeling efforts. The last POES satellite, NOAA-19, was launched in early 2009. This satellite is operating normally, and currently serves as our primary satellite for the afternoon orbit. The Metop satellite constellation, which flies in the mid-morning orbit, is robust and NOAA uses these data in its numerical weather prediction models.

When the NPOESS program was restructured in February 2010, NOAA, with NASA support had to address the following actions in parallel:

- Continue development and check out of key instruments for Suomi NPP to avoid a data gap and support NOAA's critical weather mission;
- Transfer existing contracts and award new contracts to support JPSS-1;
- Establish the cost, schedule, and performance baseline for the JPSS program;
- Develop national and international partnerships to provide cost effective means to meet some requirements; and
- Establish a NOAA-NASA team of experts to manage this complex endeavor.

As I will detail below, we have made remarkable progress on all of these fronts while working through extreme budget uncertainty, especially in FY 2011.

In October 2011, the Suomi NPP satellite was launched successfully. This mission serves as a critically important bridge between legacy satellites (NOAA's POES, NASA EOS), and the

future JPSS satellites that will use the same instruments as the Suomi NPP satellite. The success of the Suomi NPP mission also illustrates the strength of the NOAA/NASA partnership. NASA acquired the Suomi NPP spacecraft, developed one of the five instruments, co-funded another instrument with NOAA, and funded the satellite launch. NOAA's JPSS Program was responsible for the remaining three Suomi NPP instruments and the ground system. The Suomi NPP satellite has completed its commissioning phase. All instruments are currently operating and performing well, and the JPSS team continues to calibrate and validate the instrument data for operational use.

- Last month, the JPSS Program completed an optimization assessment to confirm that the content of program could be accomplished within the \$12.9 billion life cycle cost, with a current cost to completion of \$8.6 billion in the FY 2013 - FY2028 time period. The \$12.9 billion includes: Costs through FY 2012, including NOAA's contribution to the NPOESS program including its share of the development costs of the Suomi NPP instruments and the common ground system.
- Operations and Sustainment for five satellites (Suomi NPP, JPSS-1, JPSS-2, Free Flyer 1, and Free Flyer 2) through FY 2028 (a four-year extension);
- Development of four spacecrafts (JPSS-1, JPSS-2, Free Flyer 1, and Free Flyer 2)<sup>2</sup>
- The JPSS program instruments being developed include: the Advanced Technology Microwave Sounder (ATMS), the Cross Track Infrared Sounder (CrIS), the Visible/Infrared Imager/Radiometer Suite (VIIRS), Ozone Mapping and Profiler Suite-Nadir (OMPS-N) and the Clouds and Earth's Radiant Energy System (CERES) all on JPSS-1 and JPSS-2; Ozone Mapping and Profiler Suite-Limb on JPSS-2; and TSIS, integration of SARSAT, and integration of A-DCS all on Free Flyer 1 and Free Flyer 2 (SARSAT and A-DCS are being developed by foreign partners and integrated by the JPSS program). Forty environmental data record products and many more intermediate products;
- JPSS Ground System including North and South Polar receiving sites (reducing data latency to half of historical values);
- Services supporting international and interagency partnerships (Metop, GCOM) and provision to make data available for Department of Defense use; and
- Direct read out transmission and software for worldwide use of Suomi NPP / JPSS products.

In the past year, significant progress has been made in the JPSS Program, including:

- Significant progress on calibrating the Suomi NPP instruments:
  - Advanced Technology Microwave Sounder data is already being used operationally to support NOAA's global numerical weather forecast system -- a record early operational use coming seven months earlier than expected.
  - Cross-Track Infrared Sounder (CrIS) instrument data is being incorporated on a test basis into NWS weather forecast models.
  - Visible/Infrared Imager/Radiometer Suite (VIIRS) instrument data is being reviewed by the National Ocean Service (NOS) for operational use of the ocean color data in its Harmful Algal Bloom forecasts. Once the VIIRS instrument has completed

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<sup>2</sup> Cost for development and launch of Suomi NPP shared by NPOESS program and NASA. Operations and sustainment paid for by JPSS program.

calibration/validation and has been declared operational, NOS will access these data through the NOAA CoastWatch Program;

- Successful transition of all JPSS instrument and ground contracts from the former NPOESS Program;
- Eighty percent of the planned federal employees on the NOAA/NASA JPSS team are now on board (an increase of 70 percent since March, 2011)<sup>3</sup>, including the addition of Mr. Harry Cikanek as Director of the Joint Polar Satellite System Office last fall. Mr. Cikanek has more than three decades of successful program management and systems engineering experience, and comes to us from NASA's Glenn Research Center, where he most recently served as deputy director of their engineering organization. NOAA considers this a significant improvement;
- Completion of the JPSS Management Control Plan, the Program Office Estimate of the JPSS life cycle cost, and the independent review of that life cycle cost estimate which informed the President's FY 2013 Budget for JPSS;
- Successful completion of the JPSS Systems Requirements Review, allowing the Program to proceed toward its first Key Decision Point, KDP-0 in July 2012. This is the decision point at which NOAA will confirm program requirements are properly formulated, and the proposed approaches to meeting these requirements are feasible within the budget allocated. KDP-0 approval allows the program to proceed towards its Program System Definition Review, which is currently scheduled for the second quarter of Calendar Year 2013.

Additionally, the JPSS Program recently completed an optimization assessment of the Program Office Estimate, which was developed to support the Life Cycle Cost and the President's FY 2013 Budget request. During the assessment, the JPSS Program reviewed whether it could minimize the gap and launch JPSS-1 at an earlier launch date than the second quarter FY 2017. With the FY 2012 appropriation, the JPSS-1 instrument development was ramped up after a hiatus in FY 2010 and FY 2011, while the program awaited funding; work has started on the JPSS-1 spacecraft; and needed IT enhancements are being applied to the ground system. With these and other activities that had been on hold, the JPSS Program determined that it would not be able to launch earlier without introducing technical risk to the JPSS-1 development. However, the JPSS Program will endeavor to maintain the launch date as much as practicable.

NOAA, through the JPSS Program, continues to support and strengthen international partnerships that relate to maintaining continuity of polar-orbiting satellite observational capability. To that end, I offer the following important updates:

- NOAA continues to work closely with its European operational satellite counterpart, the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), in finalizing arrangements for their Metop-B launch no earlier than July 2012, and in preparing for the future launch of the Metop-C satellite. These satellites include NOAA-provided instruments developed under NOAA's POES Program.

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<sup>3</sup> The NESDIS March 28, 2011 Quarterly Update to the Commerce, Justice, Science, and Related Agencies Appropriations Committees indicates that 83 FTE were on-board at the time of 175 planned FTE. Currently, NESDIS/NASA FTE amount to 141 FTE on-board of 173 planned FTE.

- NOAA is establishing agreements with EUMETSAT for data sharing and ground support as we each undertake development of the next generation of polar-orbiting satellites -- NOAA's JPSS, and the second generation EUMETSAT Polar System (EPS-SG).
- NOAA is pleased to be working with the Japan Aerospace Exploration Agency (JAXA). On May 18, 2012, JAXA successfully launched its first Global Change Observation Mission-Water (GCOM-W1) satellite, which carries the Advanced Microwave Scanning Radiometer (AMSR-2) instrument. Agreements are in place between NOAA and JAXA wherein JPSS provides ground support to receive and distribute GCOM-W1 data in return for access to these data, which help NOAA conduct assessments of precipitation, water vapor amounts, wind velocity above the ocean, sea water temperature, water levels on land areas, and snow depths.
- Partnerships with the Canadian and French Space Agencies have been reaffirmed, with these agencies providing the satellite assisted search and rescue (SARSAT) and the Advanced Data Collection System (A-DCS) instruments planned for launch by the JPSS Program.

I will conclude my discussion of the JPSS Program by noting that, despite significant fiscal pressures, this program has made tremendous progress since its inception in February 2010. The NOAA and NASA team is working well together towards meeting the goal of launch of the JPSS-1 satellite in early FY 2017. While the JPSS team has made significant progress, there are many challenges ahead which will require the full attention and expertise of the JPSS program management and engineering team. Support for the President's FY 2013 Budget and in future years will enable JPSS to achieve mission success.

### **GAO Review of the JPSS Program**

The GAO's one recommendation for the JPSS Program is, given the importance of polar-orbiting satellite data to weather forecasts, NOAA should establish mitigation plans for risks associated with satellite data gaps in the afternoon orbit. Specific to this recommendation, NOAA is in the process of documenting in its mitigation plan, the long-standing arrangements with national and international partners to continue to provide observational data in the event of a delay in the launch of JPSS-1 or the early failure of Suomi NPP. Construction of JPSS-1 is well underway, with all contracts in place, the spacecraft under development and instruments from 60-90 percent built, and all elements progressing towards the JPSS-1 Preliminary Design Review.

### **Conclusion**

I conclude this testimony by reaffirming three key messages.

**NOAA's satellite programs are critically important to the American people.** They involve significant investment on the part of the American taxpayer for an essential benefit given the role they play in providing global observations essential to providing life- and property-saving forecasts and warnings.

**Significant progress is being made in the GOES-R and JPSS Programs.** Our current operational environmental satellite constellations are healthy and providing needed coverage. Both the GOES-R and JPSS teams are working extremely well and effectively together, and each

team has made substantial, demonstrable progress towards launch of the next generation satellite systems. Their focus must remain on getting these very important next generation space assets developed and launched.

**These programs require stable and sufficient budgets in order to** minimize disruptions that may lead to launch delays and cost increases.

NOAA and the Department of Commerce thank the GAO for the very important contributions they are making to these programs. Mr. Powner and his team's recommendations offer us the opportunity for continuous improvement as we move forward on these endeavors to maintain the continuity of the operational environmental satellites that are so crucial to protecting American lives and property. We accept their recommendations and will be responsive to them.

Finally, I wish to say that NOAA appreciates the long-standing interest by the Committee and its staff regarding NOAA's satellite program. I am happy to answer any questions you may have.